



Software *that Understands Networks*

IPv6 Modeling in OPNET

OPNET Technologies, Inc.

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System
National Ground
Intelligence Center
National Guard
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Agency (NIMA)
National Security Agency
NATO
Naval Information
Warfare Center
Naval Postgraduate School
Naval Research
Laboratories (NRL)
Naval Surface
Warfare Center (NSWC)
Naval Underwater
Warfare Center (NUSC)

NRaD/NCCOSC
SPAWAR East and West
Tri-Service Information
Management Program
Office (TIMPO)
US Army CECOM
US Army Combined
Arms Center
US Army HQDA/DISC4
US Army Missile
Command
US Army Signal Center
US Army Signal
Command
US Marine Corps
US Military Academy
US Air Force AFSOC
US Air Force SSG
US Air Force ESC
US Air Force AFCA
US Air Force HQ 38th EIW
US Air Force Information
Warfare Center
US Air Force PAC
US Air Force RADC

Civilian

Argonne National
Laboratory
Bureau of Alcohol Tobacco
& Firearms
Coast Guard
CIA
Department of Agriculture
Department of Commerce
Department of State
FAA
FBI
Federal Railroad
Administration
Federal Reserve Bank
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IRS
Idaho National
Engineering &
Environmental Lab
Jet Propulsion
Laboratory
Lawrence Livermore
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NASA- Ames
Research Center
NASA- Goddard Space
Flight Center
NASA- Glenn Research
Center
NASA- Marshall Space
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Oak Ridge National Labs
Sandia National Labs
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IPv6 Model Features



- Integrated with All Application Models
- Expanded Addressing Capabilities
- Neighbor Discovery
- ICMPv6
- RIPng
- Transition Mechanisms
 - Configured Tunnels
 - Automatic Tunnels
 - 6 to 4 Tunnels
- Interoperability with IPv4 Models

IPv6 Model Features



- IPv6 Processor
 - Dual stack IPv6/IPv4 implementation
 - IPv6 packets are sent to a different forwarding engine
- IPv6 Addressing
 - Hexadecimal address notation described in RFC 2373
 - IPv6 “condensed” format also supported
- IPv6 Routing
 - RIPng, IPv6 Static Routing Table, IPv6 Default Route
 - Route tables for IPv6 are exportable

IPv6 Model Features

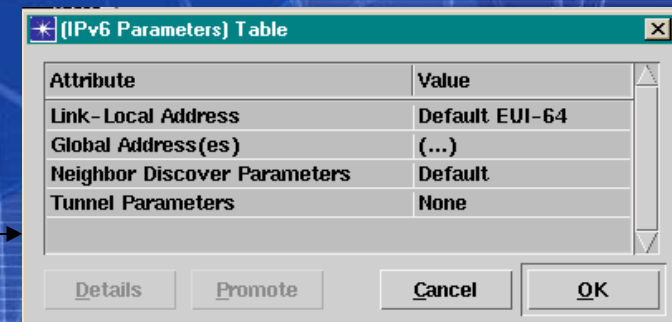
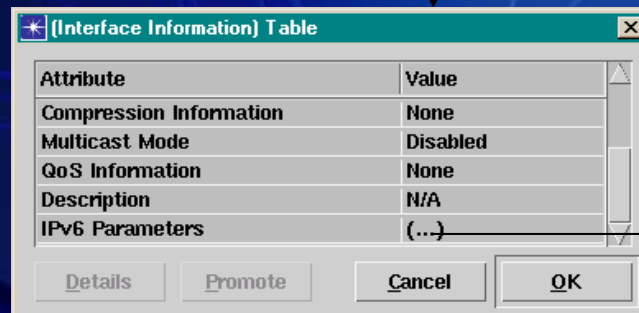
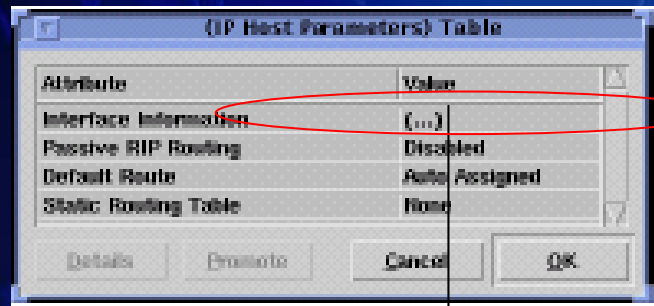


- IPv6/IPv4 Transition Mechanisms
 - Manually Configured Tunnels
 - Automatic Tunnels (use IPv4-compatible IPv6 addresses)
 - 6 to 4 Tunnels (use 6to4 addresses, prefix 2002:: /16)
 - Statistics are also supported for all tunnels including Tunneling Delay
 - Ability to configure Encapsulation and Decapsulation delay on each tunnel
- IPv6 Applications
 - All standard OPNET applications models are integrated with the IPv6 model.
- Neighbor Discovery
 - Physical layer addresses stored in global table

Attributes

- IPv6 Addressing

- “IPv6 Parameters” controls all the IPv6 specific configurations for an interface. It is located under the either “IP Routing Parameters” or “IP Host Parameters”, as seen below



IPv6 Attributes



- **Link-Local Address**

- Explicitly configured or set to use the default prefix defined in RFC 2373 **Global**

- **Address** - Configure global addresses on an interface

- **Address** – Represents the explicit IPv6 global address or the prefix for an IPv6 global address
- **Prefix Length** – length of IPv6 prefix
- **Address Type** – determines if the “Address” will be taken as the entire IPv6 address or if it will be combined with a unique interface identifier to create an IPv6 address
- **Tunnel Parameters** – used to configure IPv6 – in IPv4 tunnels for transition mechanisms
- **Source Address** – specifies the source address that will be placed in the IPv4 packet that is encapsulating an IPv6 packet
- **Destination Address** – specifies the destination address of the tunnel, which will be the destination of the IPv4 packet.
- **Tunnel Type** – specifies the type of tunnel being configured; Manual, Automatic, or 6-to-4.

- **IPv6 Routing**

- In the “Routing Protocols” attribute, under “Interface Information”, there is an additional entry for the RIPng protocol under the “Routing Protocols (s)” attribute.

- **RIPng Parameters**

- The RIPNG parameters are similar to the RIP parameters and have the same functionality.

- **IPv6 Static Routing Table**

- The IPv6 static routing table works in the same manner as the IP Static Routing Table. All entries are placed into the IPv6 Forwarding Table (IPv6 Common Route Table) where they are used for forwarding decisions.

- **IPv6 Default Route**

- This default route is placed in the Default Route table

Future Development



- Multiprotocol extension for BGP 4
- IPv6 use of background traffic
- **OSPF for IPv6**
- **Path MTU Discovery**
- **Mobile IPv6**
- **IPSec**

IPv6 Model Uses



- **Migration Planning from IPv4**
 - IPv4 Tunneling
 - Dual stack implementations
 - Address conversion
- **Class of Service Policy Planning**
- **Improved Route Processing Performance Studies**
- **Source Selected Routing Policy Planning**